

Claims

[c1] What is claimed is:

1.A throttle linkage for an outboard motor comprising:
an input end constructed to receive an operator throttle command initiated in a watercraft;
an output end constructed to be directly connected to a throttle assembly of an engine disposed in an outboard motor; and
a lever assembly having a plurality of lever arms disposed between the input end and the output end, each lever arm and the lever assembly having no means for adjusting the lever assembly.

[c2] 2.The throttle linkage of claim 1 wherein the plurality of arms includes an input arm, an engagement output arm, and an index arm integrally connected to form a first member.

[c3] 3.The throttle linkage of claim 2 further comprising a second member having a pin arm constructed to engage the engagement output arm of the first member and a connecting rod arm connected to a bar arm.

[c4] 4.The throttle linkage of claim 3 wherein the engage-

ment output arm is engaged to the pin arm in a cam-follower relationship.

- [c5] 5.The throttle linkage of claim 1 wherein the throttle assembly further comprises a throttle plate and a mechanical deadband between the output end and the throttle plate.
- [c6] 6.The throttle linkage of claim 1 attached to a two-stroke engine having a plurality of integrally formed throttle stops constructed to engage a portion of at least one of the levers.
- [c7] 7.The throttle linkage of claim 1 wherein the plurality of lever arm includes an input lever having a first arm connectable to a throttle cable.
- [c8] 8.The throttle linkage of claim 7 wherein the input lever further comprises a second arm having a cam face engagable with an output lever of the nonadjustable lever assembly.
- [c9] 9.The throttle linkage of claim 7 wherein the input lever further comprises a second arm disposable between a first and a second throttle stop wherein the throttle stops are integrally formed in an engine block.
- [c10] 10.The throttle linkage of claim 1 wherein the nonad-

justable lever assembly further comprises a first lever and a second lever wherein each lever has a nonadjustable range of rotation.

- [c11] 11.The throttle linkage of claim 1 incorporated into an outboard motor.
- [c12] 12.A throttle linkage for an engine comprising:
 - a first link rotatably attached to an engine and having a permanently fixed range of rotation;
 - an input arm integrally formed with the first link and connected to a throttle cable;
 - a second link having a permanently fixed range of rotation and engagable by an output arm of the first link;
 - and
 - a third link connected to an output arm of the second link and connected to a throttle assembly.
- [c13] 13.The throttle linkage of claim 12 wherein an output arm of the first link passes over a plane of rotation of the second link.
- [c14] 14.The throttle linkage of claim 12 wherein an engagement arm of the second link extends generally perpendicular to a plane of rotation of the first link and a plane of rotation of the second link.
- [c15] 15.The throttle linkage of claim 12 wherein the third link

has a first end connected to an output end of the second link and a second end connected to an input arm of a throttle actuator attached to the throttle assembly.

[c16] 16.The throttle linkage of claim 12 wherein the permanently fixed range of rotation of the first link is larger than the permanently fixed range of rotation of the second link and allows for disengagement therebetween.

[c17] 17.The throttle linkage of claim 12 wherein the permanently fixed range of rotation of the first link is determined by a plurality of throttle stops extending from the engine.

[c18] 18.The throttle linkage of claim 12 wherein the throttle assembly further comprises an actuator connected between the third link and a throttle plate wherein the actuator disengages the throttle plate from the third link during a portion of the permanently fixed range of rotation of the second link.

[c19] 19.The throttle linkage of claim 12 wherein the throttle assembly further comprises a throttle body connected to the engine and having a first opening with a throttle plate disposed therein and a second unobstructed opening passing therethrough.

[c20] 20.The throttle linkage of claim 12 wherein the first link

further comprises an index arm integrally formed with the first link and engagable with an idle throttle stop and a wide open throttle stop.

[c21] 21.The throttle linkage of claim 20 further comprising a pin extending from a face of the second link, the pin constructed to engage a cam face of the first link.

[c22] 22.The throttle linkage of claim 12 wherein the first link and the second link have an opening formed therethrough, each opening constructed to receive a fastener therethrough to rotatably secure each link to the engine.

[c23] 23.The throttle linkage of claim 12 wherein the third link has a fixed length and is disposed between an output end of the second link and the throttle assembly.

[c24] 24.An internal combustion engine comprising:
an engine block having at least one cylinder formed therein;
a throttle stop extending from the engine block;
a throttle assembly having an opening therethrough in fluid communication with the at least one cylinder; and
a throttle linkage connected to the throttle assembly and constructed to receive a throttle command, the throttle linkage having at least one link having an index inte-

grally formed therewith and constructed to directly engage the at least one throttle stop, wherein the throttle linkage is free of any form of adjustment.

[c25] 25.The internal combustion engine of claim 24 further comprising another throttle stop wherein both throttle stops are integrally formed with the engine block.

[c26] 26.The internal combustion engine of claim 24 wherein the throttle linkage further comprises another link, each link independently rotatably secured to the engine block allowing a separation therebetween.

[c27] 27.The internal combustion engine of claim 26 wherein the separation occurs when the index engages the at least one throttle stop.

[c28] 28.The internal combustion engine of claim 24 wherein the index extends in a direction generally transverse to a plane of rotation of the at least one link.

[c29] 29.The internal combustion engine of claim 24 wherein the at least one link has a cam surface constructed to engage a pin extending from another link, a portion of the at least one link bypassing a portion of the another link during rotation of either link.

[c30] 30.The internal combustion engine of claim 24 further

comprising a throttle plate rotatably positioned in the opening of the throttle assembly, the throttle plate disengaged from the throttle linkage during a portion of a range of movement of the throttle linkage.

[c31] 31.The internal combustion engine of claim 24 further comprising another opening through the throttle assembly on a side of the throttle assembly generally opposite the first opening therethrough.

[c32] 32.A method of manufacturing an engine comprising the steps of:

forming a throttle link having a tab;

forming an engine block with at least one throttle boss;

and

attaching the throttle link to the engine with a permanently fixed range of movement and with the tab rotatably related permanently to the throttle boss.

[c33] 33.The method of claim 32 wherein the step of forming the engine block further comprises forming the engine block with another throttle boss.

[c34] 34.The method of claim 33 wherein the step of attaching the throttle link to the engine further comprises attaching the throttle link to the engine with the tab rotatably positioned between the throttle bosses so that the tab

engages one throttle boss when a throttle plate is at an idle position and engages the another throttle boss when the throttle plate is at a wide open throttle position.